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| EXAMINER |
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| WANG, JIN CHENG |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2672 | |

DATE MAILED: 08/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

| | Application No. | Applicant(s) |
|---|---|---|
| **Office Action Summary** | 09/210,055 | MILLER, JOHN DAVID |
| | Examiner | Art Unit |
| | Jin-Cheng Wang | 2672 |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on _09 June 2005_.

2a)☐ This action is **FINAL**.     2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) _20,22,24,26,28,32,34 and 37_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _20,22,24,26,28,32,34 and 37_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1)☐ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

## DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in

37 CFR 1.17(e), was filed in this application after final rejection. Since this application is

eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e)

has been timely paid, the finality of the previous Office action has been withdrawn pursuant to

37 CFR 1.114. Applicant's submission filed on 6/9/2005 has been entered. Claims 20, 22, 24,

26, 28, 32, 34 and 37 are pending in the applications.


### *Response to Arguments*

Applicant's arguments filed June 9, 2005 have been fully considered but are moot in view

of the new ground(s) of rejection.

Although Obata does not explicitly disclose that the viewpoint vector to be exactly the

same as the light source vector, it would have been obvious to change the viewpoint vector to be

exactly the same as the light source as the viewpoint position moves to the light source position.

Obata at least suggests the viewpoint vector to be exactly the same as the light source vector by

stating that the viewpoint and the light source are determined to be on the same side of the

translucent surface wherein Fig. 2 discloses that the viewpoint vector and the light source vector

are in the opposite side of the object surface and therefore Obata teaches that the viewpoint

position is movable with respect to the object surface.

*It would have been obvious to move the viewpoint position exactly at the light source*

*position so that the viewpoint vector coincides with the light source vector and therefore theta*

*depends on the normal vector at the object surface and the viewpoint vector as the viewpoint*

*vector coincides with the light source vector. Moreover, Obata has extra freedom of*

*selecting/determining both the viewpoint vector and the light source vector.*

One of the ordinary skill in the art would have been motivated to move viewpoint

position at the light source position to view the translucent surface of the object (Obata column

7, lines 33-65) and *the eye position changes with respect to the object surface which in turn*

*changes the mode with respect to the object (Fig. 2).*

Applicant argues that "it is clear from a careful reading of Obata that the color mixing

taught therein does not provide a transparency factor depending on the angle of incidence

claimed by the Applicants, but rather a characteristic of the material forming the object to be

displayed." However, Obata teaches that the transparency factor both depends on the angle of

incidence and a characteristic of the material forming the object.

Applicant argues that Obata does not disclose a mode such as FRONT_ONLY and

BACK_ONLY etc, however, Obata discloses a mode in column 7, lines 39-49, and col. 9, lines

5-17. "...in step (3), it is **judged whether or not** a viewpoint and a light source are **on the same**

**side** of a display surface of a translucent object to be displayed. The surface is hereinafter

referred to as a translucent surface. The judgment is performed wherein, for example, an inner

product of the viewpoint vector VE and the normal vector VN and an inner product of the light

source vector VL and the normal vector VN are obtained; then it is judged whether or not the

product of the inner products is positive." Therefore, Obata discloses to judge whether a mode is

FRONT_ONLY, BACK_ONLY or BOTH_SIDES.

Applicant argues that the reference neither teaches nor suggests all limitations. This

argument is moot in view of the new ground of rejection set forth in this Office Action. In view

of the rejection to the claim 20 set forth in this Office Action, Obata at least suggests all the

claim limitations set forth in the claim 20. Moreover, Shinohara discloses the claim limitation of

assigning a transparency factor to alpha. Shinohara teaches determining a transparency at each

pixel enclosed by the vertices by correcting the transparency at each of the vertices of the

polygon based upon a Z component of the unit vectors of each of the vertices and the factor is

related to the angle at which the direction in which the surface of the polygon is inclined and

therefore it becomes possible to change the transparency depending upon the angle relative to the

direction of the line-of-sight and the light source; see column 4, lines 1-50; and column 7, lines

36-62. Shinohara discloses that Nz being a vector normal to the face of an observer/viewer and

Nz being the Z-component of the unit vector N and Nz is incident at the surface of the polygon,

and the angle of incidence being the angle between the vector N and Nz; see column 4, lines 1-

20. Shihohara further discloses that Nz is a N-component of the unit vector and depends on the

angle formed by the planar surface of the polygon and the direction of the line-of-sight; see

column 9. P=1, Nz=cos(theta); and a_out = a_in * Nz; see column 7, lines 35-67 and column 8,

lines 1-9 in which Nz changes from 0 to 1 and therefore the output transparency is changed from

opaque a_out = 0 to clear a_out = a_in; see also column 1.

It would have been obvious to have incorporate Shinohara's assigning the transparency

factor to alpha into Obata's method for *setting the coefficients associated with the intensity*

*components* so that the display of an opaque object or a translucent object (two different opacity

values associated with the same image object) is realized.

*Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 22, 24, 26, 28, 32, 34 and 37 are rejected under 35 U.S.C. 102(e) as being

anticipated by Shinohara U.S. Patent No. 5,880,735 (hereinafter Shinohara).

Re Claims 22, 24, 26, and 28:

Shinohara teaches a method, comprising:

Identifying a vector normal to a viewing surface (*the normal vector of each pixel is

determined through the complementary method by using the normal vectors of individual

vertices; column 1, lines 67 and column 2, lines 1-2; determining the normal vector of each pixel

on the planar surface also identifying the normal vector to the object surface. Identifying a*

*vector Nz being a vector normal to the face of an observer/viewer or a viewpoint vector and Nz*

*being the Z-component of the unit vector N*) and incident at an object having an object surface

(both *Nz and N is incident at the polygon having planar surfaces; column 10, lines 22-25*

*Shinohara discloses the further the angle at which the direction of the line-of-sight intersects*

*with the planar surface of the polygon, the lower the transparency becomes*), the vector

creating an angle of incidence at the object surface (*the vector Nz creates an angle of incidence*

*at the planar surfaces of the polygon or exactly at the vertices/end points of the planar surfaces*

*of the polygon* and angle of incidence being the angle between the normal vector N and the line-

of-sight Nz; see column 4, lines 1-20); and

Modulating the transparency of an image of the object as <u>a function</u> of the angle of incidence of

the vector at the object surface (<u>*column 10, lines 22-25 Shinohara discloses the further the*</u>

<u>*angle at which the direction of the line-of-sight intersects with the planar surface of the*</u>

<u>*polygon, the lower the transparency becomes*</u> **and thereby disclosing that the transparency of**

**the pixels at the object surface is a function of the angle of incidence of the vector at the object**

**surface because the transparency associated with each pixel enclosed by the vertices of the**

**polygon is a function of the angle of incidence of the viewpoint vector at the end points of a**

**planar surface on the 3D polygon.** *In column 4, lines 14-16, Shinohara discloses determining a*

**transparency at each pixel enclosed by the vertices** *by correcting the transparency at each of*

*the vertices of the polygon based upon a Z component of the unit vectors of each of the vertices*

*and* **the factor is related to the angle at which the direction in which the surface of the polygon**

**is inclined; column 4, lines 14-16** *and therefore it becomes possible to change the transparency*

*depending upon the angle relative to the direction of the line-of-sight and the light source;*

*column 4, lines 1-50; and column 7, lines 36-62*), wherein the function comprises a cosine

function or a nonlinear function (*e.g.,* **column 10, lines 22-25 Shinohara discloses the further**

**the angle at which the direction of the line-of-sight intersects with the planar surface of the**

**polygon, the lower the transparency becomes.** *Shihohara further discloses the function*

*comprising a consine function of the angle of incidence of the viewpoint vector at the end points*

*of a planar surface on the 3D polygon. Note that Nz is a Z-component of the unit vector and*

*depends on the angle formed by the planar surfaces of the polygon, the direction of the line-of-*

*sight and the normal vector of each pixel on the planar surface which is determined by using the*

*normal vectors of individual vertices; see column 9. P=1, Nz=cos(theta); and a_out = a_in \* Nz;*

*see column 7, lines 35-67 and column 8, lines 1-9 in which Nz changes from 0 to 1 and therefore*

*the output transparency is changed from opaque à_out = 0 to clear a_out = a_in; see also*

*column 1).*

Re Claims 32, 34, 37:

Shinohara teaches a computer comprising:

A processor (*see CPU 1, Fig. 1*);

A computer-readable medium comprising a storage device comprising a memory (*e.g.,*

*Fig. 1 and column 5, lines 33-46 wherein a computer program is disclosed and the computer*

*program has to be stored in a computer-readable storage medium in order to be executed; see*

*column 13, lines 33-35*); and

A computer program capable of being executed from the computer-readable medium by

the processor (*e.g., the program is executed by the CPU 1; see column 5-7 and column 13, lines*

*33-35*) to modulate a transparency factor of an image of an object as a function of an angle of

incidence of a vector at a surface of the object (***column 10, lines 22-25 Shinohara discloses the***

***further the angle at which the direction of the line-of-sight intersects with the planar surface***

***of the polygon, the lower the transparency becomes and thereby disclosing that the***

***transparency of the pixels at the object surface is a function of the angle of incidence of the***

***vector at the object surface because the transparency associated with each pixel enclosed by***

***the vertices of the polygon is a function of the angle of incidence of the viewpoint vector at the***

*end points of a planar surface on the 3D polygon.* In column 4, lines 14-16, Shinohara discloses

determining *a transparency at each pixel enclosed by the vertices* by correcting the

transparency at each of the vertices of the polygon based upon a Z component of the unit vectors

of each of the vertices and *the factor is related to the angle at which the direction in which the

surface of the polygon is inclined; column 4, lines 14-16* and therefore it becomes possible to

change the transparency depending upon the angle relative to the direction of the line-of-sight

and the light source; column 4, lines 1-50; and column 7, lines 36-62), the vector being normal

to a viewing surface (*Nz is a viewpoint vector being normal to the face of an observer/viewer

and Nz being the Z-component of the unit vector N. Both N and Nz are incident at the planar

surfaces of the polygon, and the angle of incidence being the angle between the normal vector N

and the viewpoint vector Nz; see column 4, lines 1-20*), wherein the function comprises a cosine

function or a nonlinear function (*e.g., column 10, lines 22-25 Shinohara discloses the further

the angle at which the direction of the line-of-sight intersects with the planar surface of the

polygon, the lower the transparency becomes.* Shihohara further discloses the function

comprising a consine function of the angle of incidence of the viewpoint vector at the end points

of a planar surface on the 3D polygon. Note that Nz is a Z-component of the unit vector and

depends on the angle formed by the planar surfaces of the polygon, the direction of the line-of-

sight and the normal vector of each pixel; see column 9. P=1, Nz=cos(theta); and a_out = a_in

* Nz; see column 7, lines 35-67 and column 8, lines 1-9 in which Nz changes from 0 to 1 and

therefore the output transparency is changed from opaque a_out = 0 to clear a_out = a_in; see

also column 1).

## *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Obata U.S. Patent

No. 5,222,203 (hereinafter Obata) in view of Shinohara U.S. Patent No. 5,880,735 (hereinafter

Shinohara).


Obata teaches selecting a mode, the mode is FRONT-ONLY, BOTH SIDES, or BACK-

ONLY (*The mode is **in relation to** the viewpoint vector, the light source vector and the normal*

*vector of the object surface. The directions of these vectors govern the mode for FRONT-ONLY,*

*BOTH SIDES, or BACK-ONLY; column 7*), determining a viewing angle (Determining VE to be

the same as VL; *Obata discloses viewpoint vector in Fig. 2 wherein the eye position changes*

*with respect to the object surface which in turn changes the mode with respect to the object. It*

*would have been obvious to move the viewpoint position exactly at the light source position so*

*that the viewpoint vector coincides with the light source vector and therefore theta depends on*

*the normal vector at the object surface and the viewpoint vector as the viewpoint vector*

*coincides with the light source vector. Moreover, Obata has extra freedom of*

*selecting/determining both the viewpoint vector and the light source vector. The opposite light*

*source vector −VL with respect to the reference x-axis of an arbitrary reference frame forms the*

*viewing angle and the light source vector VL coincides with the viewpoint vector VE. For the*

*sake of subsequent explanation, the angle is denoted by va_alpha),* determining an object angle

*(Determining VN; The normal vector of the object surface with respect to the reference x-axis of*

*an arbitrary reference frame forms the object angle. For the sake of subsequent explanation, the*

*angle is denoted by oa_beta),* calculating a theta, theta equals the viewing angle minus the object

angle plus pi *(theta is the angle between the normal vector VN and the viewpoint vector VE*

*which is in relation to the previously identified viewing angle and object angle. By definition of*

*theta, theta is equal to pi – oa_beta + va_alpha; column 7),* assigning a function of theta to

alpha, if the mode is FRONT-ONLY or BOTH-SIDES *(the alpha being the cosine function of*

*theta; see column 6),*

      *Obata explicitly discloses in Figs. 2 and 8 the angle of incidence theta and the brightness*

*value or the color value depends on a non-linear function of the angle theta (column 6-7). From*

*Obata's disclosure, the theta angle depends on the light source vector VL and the normal vector*

*VN. By definition, the angle theta is equal to pi – {the angle between the normal vector VN of the*

*object surface with respect to the x-axis of any reference frame} + {the angle of the opposite*

*light source vector –VL (viewing from the light source) with respect to the x-axis of any*

*reference frame}. The angle between the normal vector VN of the object surface with respect to*

*the x-axis of any reference frame is the object angle of the claimed invention and the angle of the*

*opposite light source vector –VL as viewing from the light source with respect to the x-axis of*

*any reference frame forms the viewing angle of the claimed invention. The viewing angle and the*

*object angle are inferred from the Obata's disclosure in Figs. 2 and 8 and column 6-7. The*

*viewing angle and the object angle are directly related to the angle theta and the angle theta is*

*critical for the determination of the color value or the transparency value and Obata.*

*Because the color value or transparency value can never be less than zero, alpha = cos (theta) should be always larger than or equal to zero, Obata implicitly teaches comparing alpha to zero; assigning zero to alpha, if the mode is FRONT_ONLY (FRONT_ONLY mode is a mode formed by the position or location of the viewing source or the light source in relation to the object surface and therefore is decided by the relationship of the viewing source vector or the light source vector VL and the normal vector VN at the object surface) and alpha is less than zero. Similarly, Obata implicitly teaches the transparency value to be larger than zero or equal to zero and thereby Obata teaches assigning zero to alpha, if the mode is BACK_ONLY, and alpha less than zero. Because the color value or transparency value can never be less than zero, alpha = cos (theta) should be always larger than or equal to zero, Obata implicitly teaches assigning minus alpha to alpha, if the mode is BOTH-SIDES, and alpha is less than zero (column 6-7). These above steps are measures to prevent the alpha value being less than zero which one of the ordinary skill in the art should understand that alpha value for alpha blending should not be less than zero.*

Therefore, Obata further discloses assigning a function of theta minus pi to alpha, if the mode is BACK ONLY (*Note that the mode changes when the light source and the viewpoint changes with respect to the object surface. Assigning a function of theta minus pi is equivalent to assigning a function of theta because cosine of theta minus pi reflects the brightness value after blending with the light source or the background image and is equal in absolute value to cosine of theta. BACK_ONLY corresponds to the viewpoint vector VE and the light vector being in opposite direction in which VN is rotated 180 degrees to obtain a normal vector and*

*FRONT_ONLY corresponds to the viewpoint vector VE being in the same direction to the light*

*source vector VL; column 6-7*); comparing alpha to zero; assigning zero to alpha, if the mode is

FRONT ONLY and alpha is less than zero (*Since the brightness value for an image object*

*should be positive, the inner product between the normal vector of the object surface and the*

*light source vector or cosine( pi – oa_beta +va_alpha) should be positive as well; column 6-7*);

assigning zero to alpha, if the mode is BACK ONLY, and alpha less than zero (*the image object*

*is displayed as an opaque object and since the brightness value for an image object should be*

*positive, alpha value should be zero if it is less than zero*); assigning minus alpha to alpha, if the

mode is BOTH-SIDES, and alpha is less than zero (*since the brightness value for an image*

*object should be positive, alpha value should be zero if it is less than zero*; column 6-7).

In other words, Obata discloses a method for displaying a translucent object or an opaque

object on a display screen comprising a step of displaying a translucent object by calculating the

color intensity. The color intensity comprises an ambient light component and the diffused

transmitted light component, which is in relation to an angle made between a normal vector of

the object surface and a light source vector as being at normal to the light surface, the diffused

transmitted light coefficient, and the intensity value corresponding to the light source. The angle

of incidence of the incident light source being over the range of 0 to pi, so that the object

develops its own color intensity on the basis of the diffused transmitted light coefficient Ktr, the

intensity value corresponding to the incident light from a light source. The intensity or brightness

of the image object is described by the color and/or transparency values. Obata teaches that, <u>the</u>

<u>actual display color of the image object is determined by **mixing the color of the image object**</u>

<u>**and the color of the background image**, based upon the transmissivity of the translucent object</u>

(column 1). *The transmissivity of the object is reflected as coefficient value in the image blending which is not related to the alpha value at all.* Obata teaches that, by appropriately setting the coefficients associated with the intensity components, the display of an opaque object or a translucent object can be controlled in such a way that an opaque object can be displayed by providing a zero value output from <u>the diffused transmitted light</u> component and a translucent object can be displayed by providing zero value outputs from the diffused reflection light component and the specular reflection light component (column 7) wherein the background object is displayed as blurred to obtain a superior realistic display (column 6). In the case for translucent image object, the intensity of the image object is governed by the Itr component which is proportional to the transparency factor. The transparency of the image object is determined by a number of the input parameters such as the diffused transmitted light coefficient and reflection coefficient of ambient light depending upon the relationship among the light source, the viewpoint and the object surface. The transparency is zero for an image object to be displayed as an opaque object after setting the coefficients associated with the intensity components or parameters under certain conditions. The intensity of the diffused transmitted light greatly varies in accordance with the angle theta made between the normal vector of the object surface and the light source vector as being normal to the light source surface and how much the light comes through depends upon the cosine function of theta. The angle theta is usually 0 to pi, and theta = pi signifies the case that the object surface is at a position opposite to the light source, whereas theta = 0 means the case that the object surface is in a parallel and opposed relation to the light source so that it is in the most bright condition.

Moreover, Obata a mode is in relation to the viewpoint vector, the light source vector and the normal vector of the object surface. The directions of these vectors govern the mode for FRONT-ONLY, BOTH SIDES, or BACK-ONLY. The three vectors offer extra freedom in selecting a mode.

Although Obata does not explicitly disclose that the viewpoint vector to be exactly the same as the light source vector, it would have been obvious to change the viewpoint vector to be exactly the same as the light source as the viewpoint position moves to the light source position. Obata at least suggests the viewpoint vector to be exactly the same as the light source vector by stating that the viewpoint and the light source are determined to be on the same side of the translucent surface wherein Fig. 2 discloses that the viewpoint vector and the light source vector are in the opposite side of the object surface and therefore Obata teaches that the viewpoint position is movable with respect to the object surface.

*It would have been obvious to move the viewpoint position exactly at the light source position so that the viewpoint vector coincides with the light source vector and therefore theta depends on the normal vector at the object surface and the viewpoint vector as the viewpoint vector coincides with the light source vector. Moreover, Obata has extra freedom of selecting/determining both the viewpoint vector and the light source vector.*

One of the ordinary skill in the art would have been motivated to move viewpoint position at the light source position to view the translucent surface of the object (Obata column 7, lines 33-65) and *the eye position changes with respect to the object surface which in turn changes the mode with respect to the object (Fig. 2).*

However, Obata does not specifically teach the claim limitation of "assigning a

transparency factor to alpha".

Shinohara discloses the claim limitation of assigning a transparency factor to alpha (*e.g.,*

*Shinohara teaches determining a transparency at each pixel enclosed by the vertices by*

*correcting the transparency at each of the vertices of the polygon based upon a Z component of*

*the unit vectors of each of the vertices and the factor is related to the angle at which the*

*direction in which the surface of the polygon is inclined and therefore it becomes possible to*

*change the transparency depending upon the angle relative to the direction of the line-of-sight*

*and the light source; column 4, lines 1-50; and column 7, lines 36-62. Shinohara discloses that*

*Nz being a vector normal to the face of an observer/viewer and Nz being the Z-component of the*

*unit vector N and Nz is incident at the surface of the polygon, and the angle of incidence being*

*the angle between the vector N and Nz; see column 4, lines 1-20. Shinohara further discloses*

*that Nz is a Z-component of the unit vector and depends on the angle formed by the planar*

*surface of the polygon, the direction of the line-of-sight and the normal vector of each pixel (see*

*column 1, lines 60-67 and column 2, lines 1-2); see column 9. P=1, Nz=cos(theta); and a_out =*

*a_in \* Nz; see column 7, lines 35-67 and column 8, lines 1-9 in which Nz changes from 0 to 1*

*and therefore the output transparency is changed from opaque a_out = 0 to clear a_out = a_in;*

*see also column 1).*

It would have been obvious to have incorporated Shinohara's assigning a transparency

factor to alpha to Obata's method because Obata suggests the claim limitation of "assigning a

transparency factor to alpha". In column 1 and 6-7, Obata teaches that, <u>the actual display color of</u>

<u>the image object is determined by **mixing the color of the image object and the color of the**</u>

**background image**, based upon the transmissivity of the translucent object which **dictates** the coefficients associated with the formula for calculating the brightness values (column 1). Obata teaches that, by appropriately setting the coefficients associated with the intensity components, the display of an opaque object or a translucent object can be controlled in such a way that an opaque object can be displayed by providing a zero value output from the diffused transmitted light component and a translucent object can be displayed by providing zero value outputs from the diffused reflection light component and the specular reflection light component (column 7) wherein the background object is displayed as blurred to obtain a superior realistic display (column 6). In the case for translucent image object, the intensity of the image object is governed by the Itr component which depends upon the transparency factor. The brightness value of the image object is determined by a number of the input parameters such as the diffused transmitted light coefficient and reflection coefficient of ambient light and the final brightness result of the image object depends upon the transparency value. The transparency is zero for an image object to be displayed as an opaque object after setting the coefficients associated with the intensity components or parameters, depending on the relationship among the light source, viewpoint and the object surface. The intensity of the diffused transmitted light greatly varies in accordance with the angle theta made between the normal vector of the object surface and the light source vector (viewpoint vector) as being normal to the light source surface (or viewpoint surface). The angle theta is usually 0 to pi, and theta = pi signifies the case that the object surface is at a position opposite to the light source, whereas theta = 0 means the case that the object surface is in a parallel and opposed relation to the light source so that it is in the most bright condition.

Finally, Obata teaches that, *by appropriately setting the coefficients associated with the intensity components*, the display of an opaque object or a translucent object (two different opacity values associated with the same image object) is realized. In the case for translucent image object, the intensity of the image object is governed by the Itr component and therefore **Itr is proportional to the transparency factor** for the blending of the effect of light source and the translucent image object. In this case, the brightness value is only determined by Itr because he transparency of the image object with respect to the light source is determined by a number of the input parameters such as the diffused transmitted light coefficient and reflection coefficient of ambient light wherein only Itr component determines the color of the translucent image object (column 7, lines 12-25) so that *the outline of a light source* which is *__seen through__* (blended with opacity values) the translucent object is blurred to obtain a superior realistic display of the translucent object. The other term in the image blending as being proportional to (1-alpha) is set to zero due to the fact that the coefficients related to other components are set to zero. Note that the transparency is zero for an image object to be displayed as an opaque object after setting the coefficients associated with the intensity components or parameters.

In a non-limiting example, the transparency or opacity value of an image object pixel is proportional to cos (theta) which is the inner product between the normal vector of the object surface and the viewpoint vector being perpendicular to the viewing surface (say eye ball). If the viewpoint vector is in perpendicular to the object surface, cos (theta) = 1, resulting in the maximum opacity. It is also noted that the viewpoint vector and the light source vector of the prior art reference may be changed instead of fixed relative to each other and therefore this example applies only to a very specific situation in which the sheet face or the object surface

being perpendicular to the viewpoint while the viewpoint vector and the light source vector are

in opposite direction. If both the viewpoint and the light source are perpendicular to the sheet of

paper, the transparency or opacity of the sheet of paper is maximum because cos(theta) = 1.

It would have been obvious to have incorporate Shinohara's assigning the transparency

factor to alpha into Obata's method for *setting the coefficients associated with the intensity*

*components* so that the display of an opaque object or a translucent object (two different opacity

values associated with the same image object) is realized.

Therefore, according to the teaching of Obata, it would have been obvious to assign a

transparency factor to alpha similar to what has been done in Shinohara. Doing so would enable

the modification of the color of the object by **mixing the color of two image objects such as the**

**image object and the color of background image**.

## *Conclusion*

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Jin-Cheng Wang whose telephone number is (571) 272-7665.

The examiner can normally be reached on 8:00 - 6:30 (Mon-Thu).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Mike Razavi can be reached on (571) 272-7664. The fax phone number for the

organization where this application or proceeding is assigned is 703-872-9306.

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